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**TAXONOMIC NOTES ON SOUTH AMERICAN
DENDROBATID FROGS OF THE GENUS
*Colostethus***

By

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Savage (1968) synonymized *Prostherapis* Cope, 1868 and *Hyloxalus* Jiménez de la Espada, 1871 with *Colostethus* Cope, 1867. Edwards (1971) referred 43 nominal species to the genus *Colostethus* on the basis of a review of original descriptions and examination of types and other preserved specimens. The purpose of the present paper is to provide adequate descriptions of *Colostethus taeniatus*, *C. marchesianus*, and *C. intermedius* and to describe a new species. All of the species considered are found on the eastern slopes of the Andes and the Amazonian lowlands of Ecuador (300-2910 m).

Numerical designations are used in the diagnoses for purposes of standardizing descriptions. Developmental stages of larvae are those proposed by Gosner (1960).

In order to facilitate interspecific comparisons in the diagnoses the nominal species are listed according to key characters in Table 1. These lists of species do not reflect evolutionary or taxonomic units; however, they do provide a basis for limiting the number of interspecific comparisons. Whenever a character is variable within a species that species is listed under each character state.

***Colostethus taeniatus* (Andersson)
(Figs. 1, 2a, 3a)**

Phyllobates taeniatus Andersson, 1945:8 [Holotype.—NHRM 1904 from "Rio Cosanga near Archidona," 800 m, Eastern (=Provincia Napo), Ecuador; collected by Wm. Clarke-MacIntyre and R. Blomberg in December 1937].

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TABLE 1. Nominal Species of the Genus *Colostethus* Arranged by Character State
(SVL = snout-vent length).

Toes Webbed	Toes Not Webbed
A. Basally Webbed	A. Toe Fringe Present
1. SVL greater than 18 mm	1. SVL greater than 24 mm
a. <i>elachyhistus</i>	a. <i>intermedius</i>
b. <i>fraterdanieli</i>	b. <i>latinus</i>
c. <i>kingsburyi</i>	2. SVL less than 20 mm
d. <i>subpunctatus</i>	a. <i>nubicola</i>
e. <i>variabilis</i>	b. <i>pratti</i>
2. SVL less than 18 mm	B. Toe Fringe Absent
a. <i>alagoanus</i>	1. Dorsolateral stripe present
b. <i>brunneus</i>	a. <i>alboguttatus</i>
c. <i>capixaba</i>	b. <i>bromelicola</i>
d. <i>carioca</i>	c. <i>infraguttatus</i>
e. <i>marchesianus</i>	d. <i>olfersioides</i>
B. Distinctly webbed	e. <i>pratti</i>
1. Black chest bar present	f. <i>ranoides</i>
a. <i>collaris</i>	g. <i>vertebralis</i>
b. <i>dummi</i>	2. Dorsolateral stripe absent
c. <i>herminae</i>	a. <i>anthracinus</i>
d. <i>meridensis</i>	b. <i>infraguttatus</i>
e. <i>riveroi</i>	c. <i>lehmanni</i>
f. <i>trinitatus</i>	d. <i>nubicola</i>
2. Black chest bar absent	e. <i>ramosi</i>
a. <i>beebei</i>	f. <i>taeniatus</i>
b. <i>chocoensis</i>	g. <i>vertebralis</i>
c. <i>fuliginosus</i>	h. <i>whymperi</i>
d. <i>granuliventris</i>	
e. <i>mandelorum</i>	
g. <i>mertensi</i>	
h. <i>palmatus</i>	
i. <i>shrevei</i>	
j. <i>talamancae</i>	
k. <i>vergeli</i>	

Phyllobates riocosangae Andersson, 1945:10 [Syntypes.—NHRM 1905-06 from "Rio Cosanga near Archidona, 600 m, Eastern (=Provincia Napo), Ecuador; collected by Wm. Clarke-MacIntyre and R. Blomberg in December 1937]. New synonymy.

Colostethus taeniatus—Edwards, 1971:148.

Colostethus riocosangae—Edwards, 1971:148.

Justification of Synonymy.—Andersson (1945) distinguished *Phyllobates taeniatus* from *P. riocosangae* because *taeniatus* possesses a more extensive supratympanic fold, a smooth dorsum, and a rudiment of web between the second and third fingers. Also, *taeniatus* was distinguished from *riocosangae* by the absence of inner and outer metatarsal tubercles and two narrow, black paravertebral stripes. Examination of type specimens of both nominal taxa does not substantiate all of these differences. The extent of the supratympanic fold is variable in both forms. The variation in the texture of the dorsal skin is attributed to sexual dimorphism and/or reproductive state. Large outer and small inner metatarsal tubercles are present in both nominal taxa. The type of *taeniatus* does not possess a rudiment of a web between the second and third fingers. Therefore, the only character which may distinguish *riocosangae* from *taeniatus* is the presence or absence of paravertebral stripes.

Recently I examined specimens collected along a transect east of Papallacta, Provincia Napo, Ecuador; the six localities along the transect ranged in elevation from 2550 to 2910 m. The specimens from these localities exhibit a range of variation in black dorsal striping that includes the patterns attributed to *P. riocosangae* and *P. taeniatus* (Fig. 1). In all other respects these specimens conform to the two species described by Andersson. I attribute the variation in the dorsal pattern of the specimens examined to genetic variation in a single species; therefore, *Phyllobates riocosangae* Andersson, 1945, is considered to be a junior synonym of *Colostethus taeniatus* (Andersson, 1945).

Diagnosis.—(1) Size medium, 16.4-22.9 (\bar{x} =20.44) mm; (2) males smaller than females; (3) skin finely granular dorsally, smooth ventrally; (4) tympanum distinct; (5) supratympanic fold moderately distinct; (6) first and second fingers equal in length; (7) finger discs subequal in width; (8) third finger of males not swollen; (9) digital scutes indistinct; (10) inner tarsal fold straight, extending from inner metatarsal tubercle; (11) webbing and lateral fringes absent on toes; (12) toe discs moderately expanded, equal in size; (13) dorsolateral stripe absent; (14) oblique lateral stripe narrow, extending from groin to upper eyelid; (15) ventrolateral stripe absent; (16) dorsal ground color light gray; (17) venter creamy white, with or without gray spotting on chin, throat and chest; (18) thighs greenish gray with gray longitudinal stripes anteriorly and dorsally; (19) back-riding tadpoles small, body length 4.9-5.8 (\bar{x} =5.24) mm in stages 25 and 26; (20) mouth directed antero-

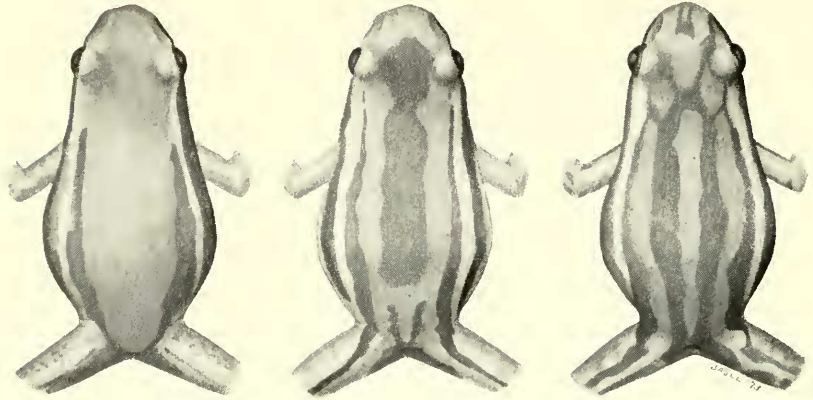


FIG. 1. Diagrammatic dorsal views of *Colostethus taeniatus* showing the range of variation in the dorsal color pattern (left to right: KU 143023, 143031, 142997).

ventrally, not umbelliform; (21) rows of denticles $2/3$ with second upper row divided medially; (22) labial papillae in one row laterally and along the lower lip; (23) upper lip bare medially; (24) anus dextral.

Colostethus taeniatus, by lacking toe webbing, lateral fringes on the toes and dorsolateral stripes (Table 1) can be distinguished from all members of the genus except *C. anthracinus*, *infraguttatus*, *lehmanni*, *nubicola*, *ramosi*, *vertebralis* and *whymperi*.

Colostethus anthracinus has a solid black venter in adult males; *C. infraguttatus* has a dark belly with discrete white spots; *C. lehmanni* and *ramosi* have distinctly barred legs; *C. nubicola* is a smaller frog (snout-vent length less than 16 mm); *C. vertebralis* has an indistinct tympanum and a broad oblique lateral stripe; and *C. whymperi* lacks a light stripe on the upper lip.

Coloration in Life.—The dorsum is greenish bronze, bordered laterally by black. The narrow oblique lateral stripe is creamy white. The flanks and canthus are black; the lips white or yellow. The thighs are pale yellow with brown spots or elongate blotches while the tibia are pale brown. The venter is greenish yellow to white with or without brown to black spots. The iris is bronze to gold and lacks reticulations.

Larvae.—The following description is based on two series of tadpoles (free-swimming, stages 28 and 37, and back-riding, stages 25 and 26).

The body is slightly depressed and flattened ventrally. The dorsal contour slopes gradually from the insertion of the dorsal fin to the level of the nostrils where it curves abruptly ventrad. The snout is blunt in dorsal view. The body is widest midway between the snout and the tail. The eyes are distinct, well separated medi-

ally, and directed dorsolaterally. The nostrils are slightly closer to the eyes than the tip of the snout. The spiracle is sinistral, slightly below the midline and slightly anterior to the midlength of the body. The anal tube is distinct and dextral. The caudal musculature tapers gradually, in width and depth, from the body to the tip of a broadly rounded tail fin. The dorsal fin tapers from a point just posterior to the tail insertion to the deepest point at about the midlength of the tail. The dorsal and ventral fins are equal in depth.

The mouth is small, directed anteroventrally and bordered on the sides and along the lower lip by a single, continuous row of papillae on fleshy lips. The upper lip is bare medially. The rows of denticles ($2/3$) are equal in length. The second upper row is divided medially and separated by the beak. The cutting edges of the beak are serrated. Back-riding tadpoles have fewer denticles on the third lower row.

In preservative the tadpoles are black above and laterally, becoming transparent ventrally and light gray anterior to the eyes. The papillae and lips are unpigmented. The caudal musculature is creamy white with grayish brown flecks in a reticulate pattern. The dorsal fin is black near its insertion with the body, becoming transparent distally with grayish brown flecks concentrated along the outer margin. In life, back riding tadpoles are greenish brown dorsally and the tail fin has pale beige flecks.

Remarks.—Modern maps of Ecuador show the Río Cosanga at elevations in excess of 1500 m. Specimens that I refer to this species were collected at elevations between 2600 and 2900 m. Therefore, I believe that Andersson was in error when he cited the elevation of the type locality as “800 m”.

Specimens Examined.—ECUADOR: *Napo*: 3 km E Papallacta, 2900 m, KU 117953-63, 117967-77, 118117 (young), 118118 (free-swimming tadpoles); 3.2 km E Papallacta, 2970 m, KU 142047-53; 5.7 km E Papallacta, 2910 m, KU 143035-45, 143525 (back-riding tadpoles), 143526-27 (free-swimming tadpoles), 143528 (young); Río Papallacta, 4.8 km E Papallacta, 2890 m, KU 143046, 143524 (back-riding tadpoles); 15 km E Papallacta, 2600 m, KU 117058-79, 127080 (back-riding tadpoles); 2.5 km WNW Cuyujua, 2550 m, KU 142974-3019, 143521 (back-riding tadpoles), 143522 (young); 5 km WNW Cuyujua, 2610 m, KU 143020-22; 7.8 km WNW Cuyujua, 2710 m, KU 143023-34, 143523 (free-swimming tadpoles); Río Cosanga, near Archidona, “600 m”, NHRM 1905-6 (Syntypes of *Phyllobates riocosangae*), “800 m”, NIIRM 1904 (Holotype of *Phyllobates taeniatus*). COLOMBIA: *Nariño*: La Victoria, 2000 m, KU 140350-81.

Colostethus intermedius (Andersson)

(Fig. 2b)

Phyllobates intermedius Andersson, 1945:5 [Holotype.—NHRM 1903 from Río Pastaza, (Provincia Pastaza), Ecuador; collected by Wm. Clarke-MacIntyre and R. Blomberg in September 1937].

Colostethus intermedius—Edwards, 1971:148.

To date, knowledge of this species has been limited to the original description (Andersson, 1945:5) based on a single specimen and its subsequent synonymy with *Phyllobates brunneus* (= *Colostethus brunneus*) Cope, 1887 by Cochran (1955:14). Cochran did not provide an explanation in placing *intermedius* in synonymy with *brunneus*.

Comparisons of the respective types is not possible, because the types of *C. brunneus* (ANSP 11241-61) are in very poor condition. However, I have examined topotypes (KU 93154-55) of *C. brunneus* and the holotype of *C. intermedius* and I find the following

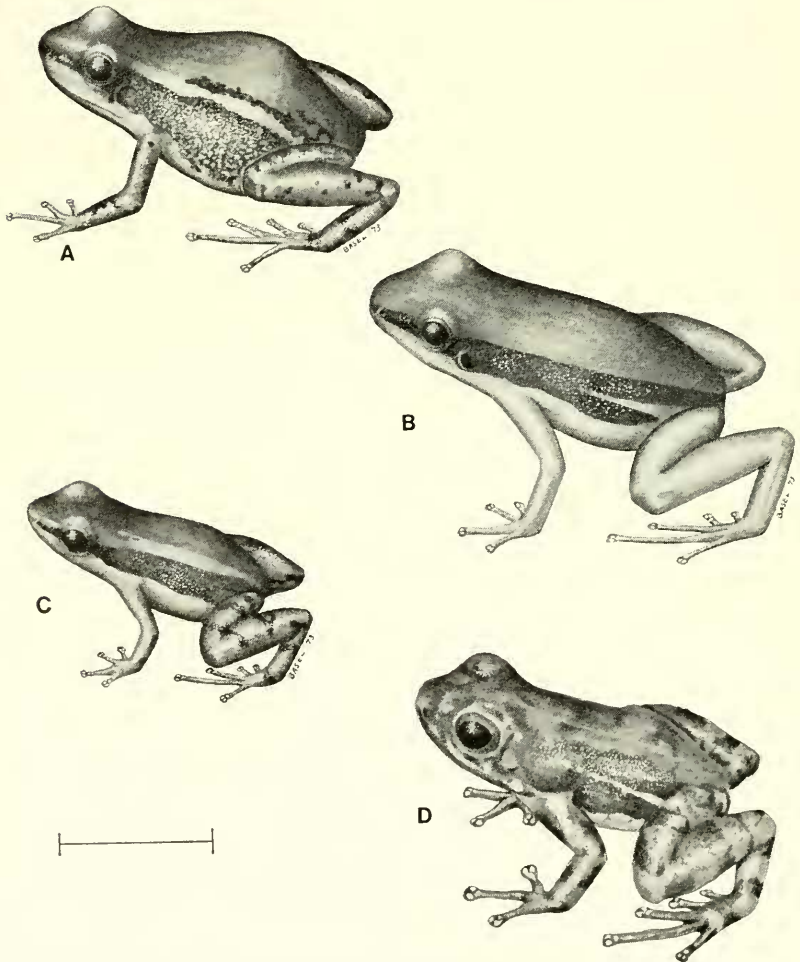


FIG. 2. Species of *Colostethus*: (a) *taeniatus* (KU 143023); (b) *intermedius* (KU 122292); (c) *marchesianus* (KU 146207); (d) *sauli* (KU 122217); scale = 1 cm.

differences: (1) *brunneus* is much smaller (snout-vent length less than 17 mm), whereas *intermedius* is much larger (snout-vent length greater than 24 mm); (2) the tarsal fold runs obliquely across the tarsus in *brunneus* while parallel to the margin of the tarsus in *intermedius*; (3) *brunneus* lacks a ventrolateral stripe found in *intermedius*; (4) the thighs of *brunneus* are barred but not in *intermedius*; and (5) the skin of the dorsum of *brunneus* is tuberculate, whereas it is finely granular to smooth in *intermedius*. Thus, I conclude that *Colostethus intermedius* is distinct from *C. brunneus*.

Diagnosis.—(1) Size moderately large, snout-vent length greater than 24 mm; (2) unknown if females are larger than males; (3) skin finely granular dorsally, smooth ventrally; (4) tympanum distinct; (5) supratympanic fold indistinct, covering posterodorsal margin of the tympanum; (6) first finger longer than second; (7) finger discs equal in width, moderately expanded; (8) unknown if the third finger of males is swollen; (9) digital scutes distinct; (10) inner tarsal fold straight, extending from the inner metatarsal tubercle; (11) webbing absent, lateral fringes present on toes; (12) toe discs moderately expanded; (13) dorsolateral stripe broad, margins indistinct; (14) oblique lateral stripe present, not extending to the eye; (15) ventrolateral stripe present; (16) dorsal ground color dark gray; (17) venter creamy yellow; (18) thighs dull orange dorsally; (19-25; larval characters) no data are available.

Colostethus intermedius is distinguished from all members of the genus except *C. latinasus* (Table 1) by lacking toe webbing, having toe fringes and snout-vent length greater than 24 mm. *Colostethus latinasus* differs from *intermedius* by lacking a ventrolateral stripe and having a reticulate pattern on the belly.

Coloration in Life.—The dorsum is olive-brown, and the dorsal surfaces of the forelimbs are greenish tan. The hind limbs are dull orange dorsally and ventrally. The flanks and canthus are black. The dorsolateral, oblique lateral and ventrolateral stripes are yellow. The venter is lemon yellow. The iris is dark brown with light gold flecks.

Larvae.—No data are available.

Specimens Examined.—ECUADOR: *Napo*: S slope Cordillera del Dué, above Río Coco, 1150 m, KU 122292-93; *Pastaza*: Río Pastaza, NHRM 1903 (Holotype).

Colostethus marchesianus (Melin)

(Figs. 2c, 3b)

Phyllobates marchesianus Melin, 1941:64 [Syntypes.—NHM 509 from Taracua, Rio Uaupes, Estado Amazonas, Brasil; Collected by D. Melin on 28 February and 25 March 1924].

Colostethus marchesianus—Edwards, 1971:148.

This species has been known only from the syntypes described

by Melin (1941:64), who referred this species to *Phyllobates* but questioned the allocation due to several deviations from the generic characters of *Phyllobates*. The characters used by Melin are consistent with those in specimens from the upper Amazon Basin in Ecuador. The only variation from the description is the absence of a third metatarsal tubercle. The presence of a third metatarsal tubercle is doubtful in any species of the genus *Colostethus*; however, in a few specimens of *marchesianus* from Santa Cecilia, Provincia Napo, Ecuador, a slight swelling is present at the joint between the tarsus and metatarsus when the metatarsus is adpressed against the tarsus. This swelling is the result of pressure exerted by the metatarsal bones against the overlying skin.

Diagnosis.—(1) Size small, snout-vent length 13.8-18.2 (\bar{x} =16.56)mm; (2) no sexual dimorphism in size; (3) skin finely pustular dorsally, smooth ventrally; (4) tympanum small, distinct; (5) supratympanic fold moderately distinct, covering posterodorsal 1/2 to 2/3 of tympanum; (6) first finger longer than second; (7) finger discs unequal in size, disc of third finger largest; (8) third finger of males not swollen; (9) digital scutes distinct, divided anteriorly by margin of disc; (10) tarsal fold absent, distinct tarsal tubercle present at midlength of tarsus; (11) toes indistinctly webbed basally, lateral fringe absent on toes; (12) toe discs moderately expanded, disc of fourth toe largest; (13) dorsolateral stripe distinct, extending from above the vent to the eye; (14) oblique lateral stripe absent, or if present, reduced; (15) ventrolateral stripe present; (16) dorsal ground color dark brown or black; (17) venter creamy white; (18) thighs, tibia, and feet pale beige with irregular brown bars or reticulations; (19) free-swimming tadpole body length 4.9-8.5 mm in stages 27 to 40; (20) mouth directed anteroventrally, not umbelliform; (21) rows of denticles 2/3 with second upper and first lower rows divided medially; (22) labial papillae in one continuous row laterally and along lower lip; (23) upper lip bare medially; (24) anus medial to slightly dextral.

By having basally webbed toes, *Colostethus marchesianus* is distinguished from those taxa that lack toe webbing or have distinctly webbed toes (Table 1). Of those taxa with basally webbed toes, *marchesianus* differs from those species with snout-vent lengths less than 18 mm (*alagoanus*, *brunneus*, *capixaba* and *carioca*) by having a ventrolateral stripe.

Coloration in Life.—The dorsum is reddish brown to dark chocolate brown. The flanks and canthus are black. The dorsolateral stripe is tan. The oblique lateral stripe, if present, and ventrolateral stripe are creamy white to yellow. The lips are also creamy white to yellow. The venter is creamy white. The throat is yellow (females) or light gray (males). The forelimbs are pale brown dorsally with dark brown bars or reticulations. The dorsal thighs,

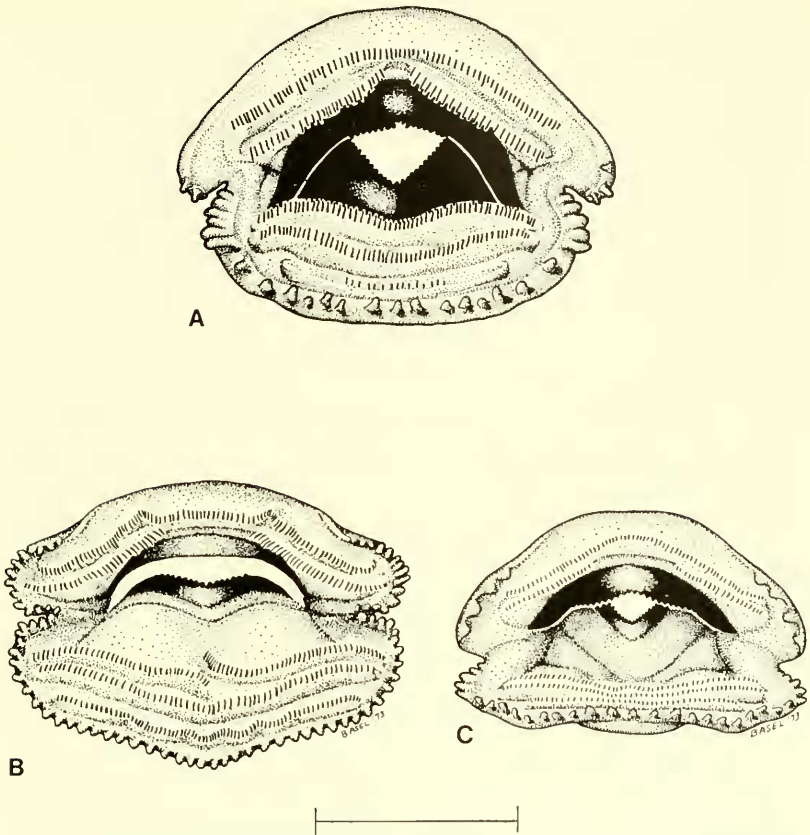


FIG. 3. Larval mouth parts of *Colostethus*: (a) *taeniatus* (one of series KU 127080); (b) *marchesianus* (one of series KU 109314); (c) *sauli* (one of series KU 109322); scale = 1 mm.

tibia, and feet are tan to chestnut brown with dark brown spots or narrow bars. The posterior surface of the thighs are brown. The ventral surfaces of the limbs are tan. The iris is bronze, without reticulations.

Larvae.—The following description is based on a series of free-swimming tadpoles (stages 27 to 40).

The body is depressed and flattened ventrally. The dorsal contour slopes gradually from the insertion of the dorsal fin to a point anterior to the nostrils, where it curves abruptly ventrad. The snout is blunt and slightly rounded in dorsal view. The body is widest at the midpoint. The eyes are moderately large, narrowly separated medially and directed dorsolaterally. The nostrils are about half way between the eyes and the tip of the snout. The spiracle is sinistral, slightly below the midline and slightly posterior to the

midlength of the body. The anal tube is medial or slightly dextral. The caudal musculature tapers gradually, in depth and width, from the body to near the tip of a narrowly rounded tail fin. The dorsal fin tapers from a point just posterior to the tail insertion to the deepest point at about one third the length of the tail. The dorsal fin is slightly deeper than the ventral fin.

The mouth is moderate in size, directed anteroventrally, and bordered on the sides and along the lower lip by a single, continuous row of papillae on fleshy lips. The upper lip is bare medially. The rows of denticles ($2/3$) are of equal length in younger specimens; the third lower row is shorter in older specimens. The second upper and first lower rows of denticles are divided medially. The lower half of the beak has a serrated cutting edge.

In preservative the tadpoles are brown above and laterally, becoming light gray ventrolaterally and transparent ventrally. The lips and papillae are unpigmented. The caudal musculature is white with brown flecks forming a reticulate pattern. The dorsal and ventral fins also have the brown flecks forming a reticulate pattern.

Specimens Examined.—ECUADOR: *Napo*: Santa Cecilia, 340 m, KU 106956-57, 109299-313, 109314 (free-swimming tadpoles), 111562-70, 122204-10, 139133, 139438 (back-riding tadpoles), 146203-13, 149663-707; Bermejo No 4, 15 km ENE Uмбаqui ($77^{\circ} 22' W$, $00^{\circ} 11' N$), 720 m, KU 122211; Puerto Libre, Río Aguarico, 570 m, KU 122212-13, 124166 (back-riding tadpoles); *Pastaza*: Sarayacu, 400 m, KU 120544.

Colostethus sauli new species

(Figs. 2d, 3c)

Holotype.—KU 122217, an adult male from Santa Cecilia, 340 m, Provincia Napo, Ecuador; collected by William G. Saul on 12 July 1968.

Paratopotypes.—KU 109315-20, collected by William E. Duellman and Henry S. Fitch on 5-14 March 1967. KU 111571, collected by William G. Saul on 15 March 1967. KU 122218-220, collected by William E. Duellman on 13 July 1968. KU 149708-10, collected by Martha L. Crump and John E. Simmons on 22 May 1972.

Diagnosis.—(1) Size moderate, snout-vent length 19.3-25.0 (\bar{x} = 22.41)mm; (2) females larger than males; (3) skin smooth dorsally and ventrally; (4) tympanum distinct; (5) supratympanic fold well developed, covering dorsal margin of tympanum; (6) first finger longer than second; (7) finger discs equal in size, greatly expanded; (8) third finger of males not swollen; (9) digital scutes distinct; (10) tarsal fold oblique, not extending from the inner metatarsal tubercle; (11) toes distinctly webbed, lateral fringe present; (12) toe discs slightly expanded, subequal in size; (13) dorsolateral stripe absent; (14) oblique lateral stripe present, not extending to the eye; (15) ventrolateral stripe absent; (16) dorsal ground color dark gray; (17) venter pale gray; (18) thighs, tibia, and feet are grayish brown with wide dark gray bars; (19) free-swimming tadpole body length 7.5-8.4 mm in stages 27 to 36; (20) mouth directed ven-

tally, not umbelliform; (21) rows of denticles $2/3$, with second upper divided medially; (22) labial papillae in one continuous row along the sides and lower lip; (23) upper lip bare medially; (24) anus dextral.

Colostethus sauli, with toes distinctly webbed, is distinguished from those members of the genus that lack toe webbing and those taxa with basally webbed toes (Table 1). Of those species having distinctly webbed toes, *C. sauli* is compared with those taxa lacking a black bar on the chest (*beebei*, *bocagei*, *chocoensis*, *fuliginosus*, *granuliventris*, *mandelorum*, *mertensi*, *palmatus*, *shrevei*, *talamancae* and *vergeli*).

Colostethus beebei is smaller (snout-vent length less than 20 mm); *C. bocagei*, *fuliginosus* and *shrevei* have more extensive toe webbing; *C. chocoensis* has more extensive toe webbing, the first and second fingers equal in length and lacks lateral fringes on the fingers; *C. granuliventris*, *palmatus* and *vergeli* are larger (snout-vent length greater than 28 mm); *C. mandelorum* has a marbled pattern on the belly and a dorsolateral stripe; *C. mertensi* has a distinctive marbled pattern on the belly; and, *C. talamancae* lacks an oblique lateral stripe and has a ventrolateral stripe.

Description and Variation.—The head is slightly wider than long and the same width as body. The ratio of head width to snout-vent length is 0.35-0.43 ($\bar{x}=0.380$). The snout is blunt, slightly sloping in lateral profile. The canthus rostralis is rounded and the loreal region is slightly concave. The nostrils are lateral and much closer to the tip of the snout than to the eye. The diameter of the eye is greater than the distance between the eye and the tip of the snout. The tympanum is distinct with a diameter of less than one-half the diameter of the eye. The supratympanic fold is well developed and covers the posterodorsal margin of the tympanum. The tongue is cordiform to oval, not notched posteriorly and the posterior two-thirds is free. The vocal slits are 20-25% of the length of the mandible.

The skin is smooth on the dorsum, venter, flanks, and limbs. The cloacal opening has a bifurcated dorsal flap. The outer palmar tubercle is subtriangular, slightly raised and larger than the oval inner palmar tubercle. The subarticular tubercles are round. The fingers lack webbing and lateral fringes. The disc of the third finger is equal to three-fourths the diameter of the tympanum. The first finger is longer than the second. The third finger of the males is not swollen.

The ratio of the tibia to the snout-vent length is 0.46-0.58 ($\bar{x}=0.512$). The inner tarsal fold is short, oblique, extending along the distal one-fourth of the tarsus, terminating in an indistinct tarsal tubercle. The inner plantar tubercle is oval; the outer plantar tu-

bercle is round and slightly smaller. The subarticular tubercles are round. The toe discs are expanded, but smaller in diameter than the finger discs. The toes are basally webbed with lateral fringes extending to the base of the discs.

Coloration in Preservative.—The dorsal ground color of the adults is dark gray with irregular black blotches. The canthal stripe is black. The flanks are dark gray. The lips are pale gray. The oblique lateral stripe is light gray, originating in the groin and extending obliquely half-way across the flanks. The upper arm is light grayish brown dorsally with a distinct white spot at the insertion to the body. The ventral upper arm is light gray. The forearm is light grayish brown with one or two narrow black bars. The hands are light grayish brown. The thighs are pale grayish brown with a darker gray irregular longitudinal stripe along the anterior surface and two dark gray transverse bars on the dorsal surface. There is a white spot on the dorsal surface of the thigh at the insertion to the body. The shanks and feet are pale grayish brown with wide dark gray transverse bars. The venter is pale (females) to dark (males) gray, becoming paler in the groin.

In preservative, juveniles are paler dorsally and the blotches are more distinct. The venter is creamy white.

Coloration in Life.—The dorsal ground color is grayish olive with distinct black blotches. The dorsal surface of the limbs is brown with darker brown bars. The flanks are black. The oblique lateral stripe is yellow. The anterior and posterior surfaces of the thighs are mottled gray on creamy white. There is a greenish yellow spot on the dorsal surface of the upper arm and thigh at the insertion to the body. The venter is a uniform pale gray. The iris is dull gray to reddish brown.

Larvae.—The following description is based on a series of free-swimming tadpoles (stages 27 to 36).

The body is depressed, flattened ventrally. The dorsal contour slopes gradually from the insertion of the dorsal fin to the nostrils where it curves abruptly ventrad. The snout is blunt in dorsal view. The body is widest at the level of the eyes. The eyes are distinct, widely separated and directed laterally. The nostrils are half-way between the eyes and the tip of the snout. The spiracle is sinistral, situated on the lower third of the body at the midpoint. The anal tube is dextral. The caudal musculature tapers gradually, in depth and width, from the body to near the tip of the narrowly rounded tail fin. The tail fin becomes pointed posteriorly in larger specimens. The dorsal fin is absent from the anterior one-third of the tail. The deepest point on the dorsal fin is near two-thirds of the tail length. The ventral fin originates at the body, getting the deepest at two-thirds the tail length.

The mouth is moderate in size, directed ventrally and bordered laterally and on the lower lip by one continuous row of papillae on fleshy lips. The upper lip is bare. The rows of denticles ($2/3$) are unequal in length; the upper two rows and the inner two lower rows are subequal in length, the third lower row is much shorter. The second upper row is divided medially but not separated by the beak. The beak has serrated cutting edges.

In preservative, the body is brown becoming pale gray posteroventrally near the insertion of the tail. The papillae and lips have small greenish brown spots. The caudal musculature is creamy white with large greenish brown spots in younger specimens and solid greenish brown in older specimens. The dorsal and ventral fins have fine greenish brown flecks.

Etymology.—This species is named in honor of F. William Saul for his many contributions to the Museum of Natural History at The University of Kansas and without whose assistance much of the work at Santa Cecilia, Ecuador would not have been possible.

Specimens Examined.—ECUADOR: *Napo*: Santa Cecilia, 340 m, KU 109315-20, 109322 (young), 109323 (free-swimming tadpoles), 111571, 122214-16 (young), 122217-20, 124165 (free-swimming tadpoles), 149708-10; Lago Agrio, 330 m, KU 126289-91; Limón Cocha, 300 m, KU 99121, MCZ 58389-92.

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LITERATURE CITED

ANDERSSON, L. G.

1945. Batrachians from east Ecuador collected 1937, 1938 by Wm. Clarke-MacIntyre and Rolf Blomberg. *Arkiv. Zool.*, 37A(2):1-88.

COCHRAN, D. M.

1955. Frogs of southeastern Brazil. *Bull. U.S. Nat. Mus.*, 206:xvi+409 pp.

EDWARDS, S. R.

1971. Taxonomic notes on South American *Colostethus* with descriptions of two new species (Amphibia, Dendrobatidae). *Proc. Biol. Soc. Wash.*, 94(18):147-162.

GOSNER, K. L.

1960. A simplified table for staging anuran embryos and larvae with notes on identification. *Herpetologica*, 16:183-190.

MELIN, D.

1941. Contributions to the knowledge of Amphibia of South America. Goteborges Kungl. Vetensk.-och Vitterh.-Sam. Handl., Ser. B, 1(4):1-71.

SAVAGE, J. M.

1968. The dendrobatid frogs of Central America. Copeia, 1968(4):745-776.

SUMMARY

Phyllobates riocosangae Andersson, 1945, is synonymized with *Colostethus taeniatus* (Andersson, 1945), and *C. intermedius* (Andersson, 1945) is removed from synonymy with *Phyllobates brunneus* Cope, 1887. *Phyllobates marchesianus* Melin, 1941, is placed in the genus *Colostethus*. *Colostethus sauli*, from Santa Cecilia, Ecuador, is described as a new species.

Diagnoses are presented which compare and distinguish *taeniatus*, *intermedius*, *marchesianus* and *sauli* from all nominal taxa in the genus. Also, a description is provided of the coloration of the adult in life, and the larvae are described for all species considered except *intermedius*. The adults and larval mouth parts are figured.

RESUMEN

Se coloca a *Phyllobates riocosangae* Andersson, 1945 como sinónimo de *Colostethus taeniatus* (Andersson, 1945) y se rescata a *C. intermedius* (Andersson, 1945) del sinónimo de *Phyllobates brunneus* Cope, 1887. Se coloca a *Phyllobates marchesianus* Melin, 1941 en el género *Colostethus*. Se describe a *C. sauli* de Santa Cecilia, Ecuador como nueva especie para la ciencia.

Se presentan las diagnosis para compara y distinguir a *taeniatus*, *intermedius*, *marchesianus* y *sauli* de las taxa nominales en el género. Tambien se da la descripción del color de los adultos en vida, y se describen los renacuajos de todas las especies excepto *C. intermedius*. Se proveen las figuras de los adultos y las partes bucales de los renacuajos.